

# Writing in the Secondary Science Classroom

CSCOPE Reference Manual



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## About the Manual

CSCOPE middle school and high school lessons refer to many different opportunities and methods for students to communicate their understanding of scientific concepts. For consistency in developing the students' ability to write in a logical manner, various types of written communication will be addressed in this manual. This reference manual is designed to give the teachers a general understanding of how some of the written communications can be scaffolded to progress students from Grade 5 to a high school capstone course, such as environmental systems.

## Introduction

One of the greatest tools we can give our students to help make them “college” and “world” ready is the ability to communicate their observations and understandings in a rational method. The communication process in the science classroom, whether verbal or written, enhances the knowledge and understanding of both the student who is doing the communicating and the student(s) with whom the communication is directed.

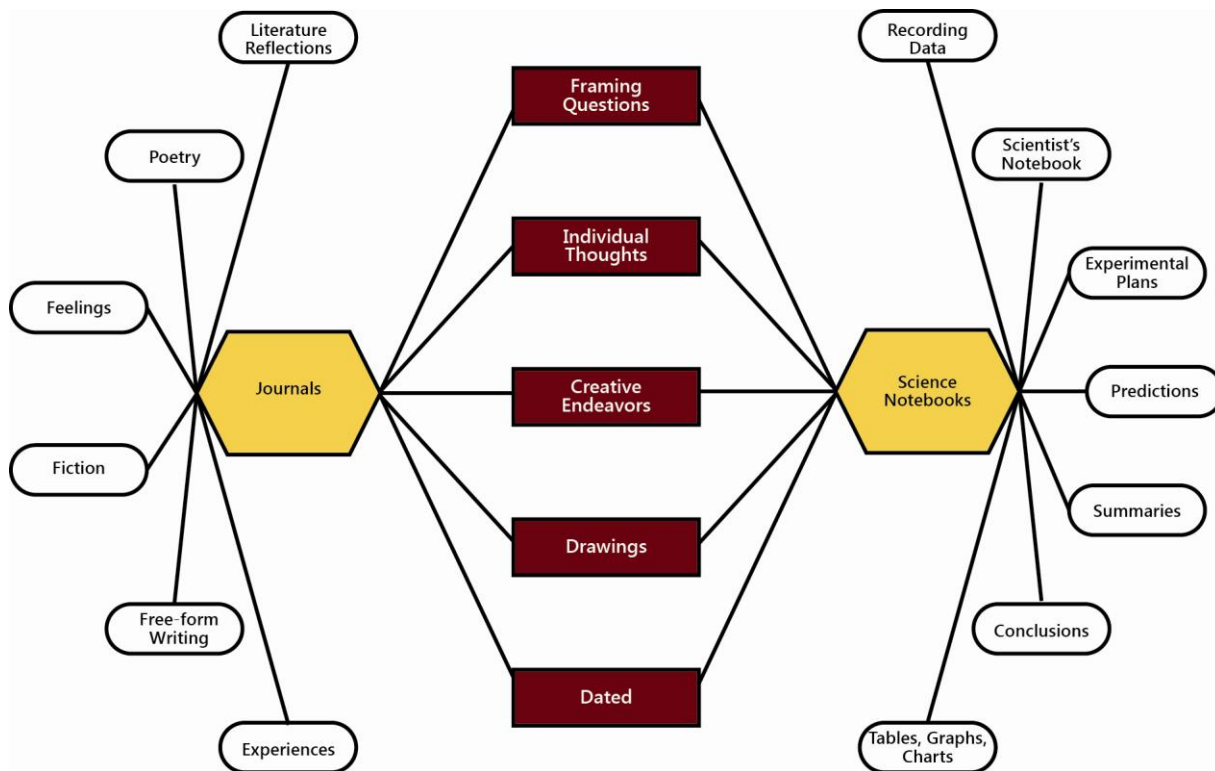
The science Texas Essential Knowledge and Skills (TEKS) for Grades Kindergarten through high school reference the definition of science from the National Academy of Sciences by stating, “...use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process.” This definition sums up the need of the students to communicate their scientific findings in a manner that demonstrates both their ability to use evidence to back up their statements, and the knowledge they gained through the investigative process.

Under the strand, “scientific investigation and reasoning,” the new science TEKS for Grades 6, 7, and 8 refer to the students' ability to “write” (2C) and “communicate valid conclusions supported by data” (2E). High school courses, biology (2H), chemistry (2I), environmental systems (2K), and physics (2K) all refer to the students' ability to “communicate valid conclusion supported by the data.” For these courses, one of the methods listed is lab reports. IPC (2E) simply refers to the students' ability to “communicate valid conclusions.” In all high school courses, (3B) states, “communicate and apply scientific information extracted from various sources.”

# Science Notebook

## Defining the Science Notebook:

Many resources use the terms journal, science notebook, and laboratory notebook interchangeably. The following diagram shows the relationship that exists between journals and science notebooks.



## Making Decisions:

Laboratory notebooks play a major role in scientific investigations and have a positive impact on writing achievement in the science classroom. The design and format of laboratory notebooks may vary considerably. As the classroom teacher, you will need to decide on the type of format you would like to use and the specific things that you want the students to be accountable for in their notebooks.

There are many websites that have suggestions as to the different ways of setting up notebooks and the types of activities that might be included. Some considerations include how often you will need to take up the notebook for grading, student ownership, and how the students will use their notebooks to demonstrate application of scientific concepts. Throughout CSCOPE science courses, there will be reference materials or resources provided for the students to glue or write into their notebooks for future use.

There are some aspects of science notebooks that are considered “standard format,” which include a table of contents, dated pages, and using a strikeout method rather than erasing. However, there are many aspects of a science notebook that need to be determined at the district, school, or teacher level, such as:

- Do you want the students to use a specific type of notebook? If so, what kind? Some types of notebooks that are commonly used are spiral notebooks, spiral notebooks with graph paper, or composition books.
- What do you want the students to include in their science notebook?
- How are you going to grade certain (or all) aspects of the science notebook?

## General Instructions on Setting up a Science Notebook:

1. Have the students take out their notebooks.
2. Have the students put their name, class period, and the date on the front cover of the notebook.
3. Tell the students to turn to the first page and put "Table of Contents" on the 2nd page of the notebook.
4. Have the students number each page in the top right hand corner. Number 1 can start with the first page or the first page after the "Table of Contents." Plan for two or three pages for the Table of Contents, depending on the amount of material that will be included in the notebook.
5. Tell the students that they should always use black or blue ink- never erase anything. If they make a mistake, they can simply put a strike-through across a word, sentence, or paragraph that they do not want.
6. Introduce how the notebook should be set up. Include the types of items that will be expected to be found in the laboratory notebooks.
7. Give each student a copy of a section from the Handout: **Laboratory Report Format**. Have them cut it out and glue it to the inside front cover (or other place that is decided) of the notebook. Tell them that they will use this as a guide to writing their laboratory reports. It will be introduced later.
8. Give each student a copy of a section from the Handout: **Laboratory Report Score Sheet**. Have them cut it out and glue it to the inside back cover (or other place that is decided) of the notebook.
9. Give each student a copy of a section from the Handout: **Writing an Abstract on a Science Journal Article**. Have them cut it out and glue it to the inside front cover (or other place that is decided) of the notebook. Tell them that they will use this as a guide to writing their laboratory reports. It will be introduced later.
10. Give each student a copy of a section from the Handout: **Abstract Rubric**. Have them cut it out and glue it to the inside back cover (or other place that is decided) of the notebook.
11. Give each student a copy of any of the resources that they may need in their science notebook (e.g., a copy of the periodic table, STAAR reference sheets, etc.).
12. Instruct the students where they can add the reference materials. The back of the notebook generally works well because they can find it easily.

# Laboratory Reports

## General Laboratory Report Guidelines:

The laboratory format and score sheet provided in this manual are general. These guidelines are based on the most accepted and expected aspects found in laboratory reports. Some of the sections of a laboratory report will be more pronounced in a given investigation than others. There are many different versions that can be used. Give students the version that you would like them to use.

You must show the students what you expect from a laboratory report and set the expectations early. Do not take it for granted that the students will know how to write a good report without any help from you. Students generally seem to struggle with the discussion section because they simply want to state what the data shows them. They need to learn to back up these claims or statements with evidence and justifications.

## Abstracts

What is an abstract? An abstract is a self-contained, concise, yet detailed statement that describes a larger work. An abstract is not a review, nor is it an evaluation of the information in the science journal. An abstract contains key words and information that allow a reader to decide if they want to read the original article. There are two types of abstracts: descriptive and informative. A descriptive abstract indicates the type of information found in the work. It makes no judgments about the work. It does not provide results or conclusions of the research. A descriptive abstract are usually short, about 100 words. An informative abstract does not review the work, but instead presents the main ideas, the results, the evidence, and the recommendations of the author.

The teacher may use a format of their choosing, however some common components would include: the reason for writing the abstract (why would a reader be interested in reading the original article), the problem (argument or claim), the methodology used, the results, and the implications. Writing an abstract helps students improve their technical writing in the science classroom.

It is up to the teacher exactly when and how often the students should complete an abstract. The course or grade level of your students should dictate exactly what types of articles the students should be reading. The higher level the student, the more technical the material should be.

# Resources for Science Notebook

## Laboratory Report Format

Cut-out one per student and to glue into science notebook

### Laboratory Report Format

**Title:**

- Creative
- Informative
- Appropriate

**Purpose/Problem:**

- Complete Sentence
- Appropriate punctuation
- Clear

**Introduction:**

- Introduce topic
- Define terms
- State hypothesis

**Materials:**

- Listed in columns

**Procedures:**

- Numbered
- Complete Sentences
- Short, direct, one-step procedures

**Results/Analysis:**

- Data tables
- Graphs
- Calculations

**Discussion:**

- Interpretation of data, graphs, results, and analysis
- State findings and related to introduction
- Support findings with data, graphs, and/or analysis

**Conclusion:**

- Short – 2 to 3 sentences
- Refer back to purpose/problem
- Concisely state findings

**\*Do not write in first person!**

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- Concisely state findings

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## Laboratory Report Score Sheet

Cut-out one per student and to glue into science notebook

Laboratory Report Score Sheet	
	Point Value    Score
<b>Title:</b>	
• Report has no title	0
• Title is incomplete or inappropriate	3
• Title is complete and appropriate	5
<hr/>	
<b>Purpose/Problem:</b>	
• None stated	0
• Incomplete sentence	3
• Complete sentences with appropriate punctuation	5
<hr/>	
<b>Introduction:</b>	
• No introduction	0
• Incomplete introduction	5
• Complete introduction	10
<hr/>	
<b>Materials and Procedures:</b>	
• Materials not listed/procedures lacking	0
• Materials listed/procedures incomplete	10
• Materials and procedures complete	15
<hr/>	
<b>Results and/or Analysis:</b>	
• No graphs or data	0
• Improperly labeled graphs/some data	5
• Graphs complete/data incomplete	10
• Complete results with analysis if appropriate	20
<hr/>	
<b>Discussion:</b>	
• No discussion	0
• Relates to introduction, no interpretation of data	5
• Interpretation of data, data not used to support statements	10
• Complete discussion	20
<hr/>	
<b>Conclusion:</b>	
• No conclusion	0
• Incomplete conclusion	3
• Complete conclusion	5
<hr/>	
<b>Participation:</b>	
• Very little participation	5
• Full participation with inadequate report	10
• Full participation with adequate report	20
<hr/>	
<b>Lab Report Score</b> _____	

Laboratory Report Score Sheet	
	Point Value    Score
<b>Title:</b>	
• Report has no title	0
• Title is incomplete or inappropriate	3
• Title is complete and appropriate	5
<hr/>	
<b>Purpose/Problem:</b>	
• None stated	0
• Incomplete sentence	3
• Complete sentences with appropriate punctuation	5
<hr/>	
<b>Introduction:</b>	
• No introduction	0
• Incomplete introduction	5
• Complete introduction	10
<hr/>	
<b>Materials and Procedures:</b>	
• Materials not listed/procedures lacking	0
• Materials listed/procedures incomplete	10
• Materials and procedures complete	15
<hr/>	
<b>Results and/or Analysis:</b>	
• No graphs or data	0
• Improperly labeled graphs/some data	5
• Graphs complete/data incomplete	10
• Complete results with analysis if appropriate	20
<hr/>	
<b>Discussion:</b>	
• No discussion	0
• Relates to introduction, no interpretation of data	5
• Interpretation of data, data not used to support statements	10
• Complete discussion	20
<hr/>	
<b>Conclusion:</b>	
• No conclusion	0
• Incomplete conclusion	3
• Complete conclusion	5
<hr/>	
<b>Participation:</b>	
• Very little participation	5
• Full participation with inadequate report	10
• Full participation with adequate report	20
<hr/>	
<b>Lab Report Score</b> _____	



**Writing an Abstract on a Science Journal Article**  
Cut-out one per student and to glue into science notebook.

### **Writing an Abstract on a Science Journal Article**

- Choose an article of interest from an appropriate science journal. The article must be a minimum of two pages in length.
- Copy or print the article.
- Write the bibliographic information at the top of the page.
- The abstract should include four paragraphs with the following information:
  1. What is the article about? Please include the purpose of the research and the problem the researchers were attempting to solve.
  2. How was the research conducted? What research methods or techniques were used?
  3. What did the research findings indicate? What was the final outcome of the research? Is more research planned for the future?
  4. Give your evaluation of the article. What is your opinion of the piece? Explain your evaluation.
- Staple the abstract to the top of the article.

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  4. Give your evaluation of the article. What is your opinion of the piece? Explain your evaluation.
- Staple the abstract to the top of the article.

## Abstract Rubric

	<b>Bibliography of Article</b>	<b>Purpose and Problem</b>	<b>Research Methods and Techniques</b>	<b>Research Findings and Outcomes</b>	<b>Personal Evaluation</b>
<b>4</b>	Copy of article present  Bibliography present with no errors	Purpose and problem stated accurately  Excellent grammar and use of technical terms	Research methods and techniques are accurately summarized  Excellent grammar and use of technical terms	Research findings and outcomes are accurately summarized  Excellent grammar and use of technical terms	Personal evaluation shows reflection on information from article  Excellent grammar and use of technical terms
<b>3</b>	Copy of article present  Bibliography present with no major errors	Purpose and problem are accurately stated  Minor grammar errors	Research methods and techniques are accurately summarized  Minor grammar errors	Research findings and outcomes are accurately summarized  Minor grammar errors	Personal evaluation shows reflection on information from article  Minor grammar errors
<b>2</b>	Copy of article  Bibliography has major errors	Purpose OR problem not stated or are inaccurate	Research methods and techniques are partially summarized, more elaboration needed	Research findings and outcomes are partially summarized, but more elaboration needed	Personal evaluation shows little reflection on information from the article
<b>1</b>	No copy of article  Bibliography has major errors	Purpose AND problem not stated or are inaccurate	Research methods and techniques summarized do not match what is written in the article	Research findings and outcomes do not match what is written in the article	Personal evaluation has no connection to information from the article
<b>0</b>	No bibliography  No Article	No attempt	No attempt	No attempt	No attempt

## References

- Fulton, L., & Campbell. (2005). *Creating student-centered science notebooks*. Retrieved June 1, 2011, from <http://www.esiponline.org/csl/presentations/lorifulton.pdf>
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- Klentschy, M. (2005, November/December). Science notebook essentials: A guide to effective notebook components. *Science and Children*, 43(3), 24-27. Retrieved June 1, 2011, from <http://notebooksfrsd.wikispaces.com/file/view/Science+Notebook+Essentials.pdf>
- Dolphin, W. (1999). In *Biological investigations: form, function, diversity, and process* (5th ed.). New York: McGraw-Hill. Retrieved June 1, 2011, from <http://www.studygs.net/labreports.htm>